

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 3272 (DSI-3272)

Atmospheric Methane Mixing Ratios from Flask Samples

March 19, 2003

National Climatic Data Center
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1. **Abstract:** This data set represents the most comprehensive methane data set available in the world. The data set contains methane mixing ratios in parts per billion (ppb = parts in 10^9 by volume) based on measurements from the NOAA/CMDL Cooperative Flask Sampling Network from 1983-1991. There are 39 worldwide sites of which 32 were still active in 1991. These data are updated periodically as part of a cooperative effort between CMDL and NCDC that is supported as a core project by NOAA's Climate & Global change Program. These data are also available on-line via Internet on a CMDL workstation.

The air samples are collected by two general methods: flushing and then pressurizing glass flasks with a pump or opening a stopcock on an evacuated glass flask. (See Steele et al., 1987 and Lang et al., 1990a,b for details of the sampling network, equipment, and procedures.)

All samples were analyzed for methane at the NOAA/CMDL laboratory in Boulder by gas chromatography with flame ionization detection. Two aliquots of air were measured from each flask with sufficient overpressure to do so. All samples were referenced against the NOAA/CMDL methane standard scale (see Lang et al., 1990a,b). Based on analyses of 2 aliquots from each flask sample, the precision is estimated at 0.3% for the entire period, 1983-1991, and the uncertainty estimated for the value obtained by averaging two aliquots from each flask is 0.2%.

2. **Element Names and Definitions:**

Station ID

This is a 3-character alphanumeric representing station identifier assigned by CMDL. Allowable values are listed under topic STATION: Network participation, along with station name and other identifier information.

Collection Date

This is an 8-character integer representing the Greenwich Mean Time (GMT) date (year, month, day) that the flask sample was collected at the cooperative station. Allowable values range from 83 01 01 to 91 12 31.

Collection Hour

This is a 2-character integer representing the GMT hour that the sample was collected at the cooperative station. Allowable values are 00 to 23 and 99, where 99 represents a missing value.

Collection Minute

This is a 2-character integer representing the GMT minute that the sample was collected at the cooperative station. Allowable values are 00 to 59 and 99, where 99 represents a missing value.

CH₄ concentration

This is a 7-character real number representing the methane mixing ratio in parts per billion (ppb = parts in a 10^9 volume of the air sample). An example of a value for this field is 1551.98 ppb.

Flask ID

This is an 8-character alphanumeric representing the flask-id assigned to each flask. The code may be used to aid in combining the methane measurement data with carbon dioxide data obtained from the same flask. The Flask ID and Collection Date and Time uniquely identify each flask

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observation.

Collection Method

This is a 1-character alphanumeric representing the method that was used in collecting the flask sample. Allowable values are:

- P Portable, battery-powered suitcase sampler. Two flasks normally connected in series, flushed with air, and then pressurized to 1.25-1.5 ambient atmospheric pressure.
- T Filling of an evacuated 3-liter glass flask by opening the single O-ring sealed stopcock
- S Filling of 0.5 liter glass flasks (in pairs) at the NOAA/CMDL observatory sites. Flasks are filled and pressurized by diverting air from continuous in situ CO2 analysis systems.
- N Filling and pressurizing of 0.5 liter glass flasks (in pairs) by a pump different from that supplied by NOAA/CMDL (used with collection method P). In most cases (eg. at NWR and CGO) the pump is a Metal Bellows pump. In addition, the flasks filled by this method at the Cape Grim Baseline Air Pollution Station (site code CGO) are filled with air that has been dried chemically.
- F Filling of an evacuated 5-liter glass flask by opening the single ground-glass greased stopcock.

Analysis Date

This is an 8-character integer representing the (local Boulder, CO time) date (year, month, day) that the flask sample was analyzed at CMDL. Allowable values range from 83 01 01 to 91 12 31.

Quality Flag

This is a 1-character alphanumeric representing the corresponding quality flag assigned to each methane mixing ratio. Allowable values are:

blank an absence of a flag (or a blank) indicates the sample and measurement were consider acceptable

+ samples in which CMDL believed to be non-background

* samples with an obvious problem during sample collection or analysis.

3. **Start Date:** 19839999

4. **Stop Date:** 1991

5. **Coverage:** A worldwide station network exists for 39 fixed locations. The locations are chosen to provide a representative spatial sample of the CH4 measurements.

Latitude range: 82 degrees north to 90 degrees south

Longitude range: 180 degrees east to 180 degrees west

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6. How to Order Data:

Ask NCDC's Climate Services about the cost of obtaining this data set.
Phone: 828-271-4800
FAX: 828-271-4876
e-mail: NCDC.Orders@noaa.gov

7. Archiving Data Center:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. Technical Contact:

Climate Monitoring and Diagnostics Lab
NOAA/ERL
R/E/CG1
325 Broadway
Boulder, CO 80303

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001

9. Known Uncorrected Problems: It has been found that the standard scale used to calculate the sample methane concentrations was found to agree with the National Institute of Standards and Technology better than 1%. Based upon the analysis of two aliquots from each flask, and overall precision of the analysis was 0.3%. In cases where both members of a flask pair were analyzed for methane, agreement between measurements was found to be within 5 parts per billion.

10. Quality Statement: This data set has gone through extensive quality control. Quality checks have been performed by CMDL on the actual methane flask concentrations. NCDC has performed internal consistency checks on the historical file for all data fields. On a scale of 0 to 2, the quality level of this data set is 2. It has been reported that samples analyzed after November 1983 show less scatter than samples before that time due to the transition to a more precise gas chromatograph. Also in August 1985, the gas chromatograph was changed to a different brand.

11. Essential Companion Datasets: None.

12. References: The following references are available for more detailed information. The Steele et al. (1987) article gives extensive details on the entire methane program.

Lang, P.M., L.P. Steele, R.C. Martin, and K.A. Masarie, 1990a, Atmospheric methane data for the period 1983-1985 from the NOAA/GMCC global cooperative flask sampling network, NOAA Technical Memorandum ERL CMDL-1.

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Lang, P.M., L.P. Steele, and R.C. Martin, 1990b, Atmospheric Methane data for the period 1986-1988 from the NOAA/CMDL global cooperative flask sampling network, NOAA Technical Memorandum ERL CMDL-2

Lang, P.M., L.P. Steele, and L.S. Waterman, R.C. Martin, K.A. Masarie, and E.J. Dlugokencky, 1992, NOAA/CMDL Atmospheric methane data for the period 1983-1990 from shipboard flask sampling, NOAA Technical Memorandum ERL CMDL-4.

Steele, L.P., P.J. Fraser, R.A. Rasmussen, M.A.K. Khalil, T.J. Conway, A.J. Crawford, R.H. Gammon, K.A. Masarie, and K.W. Thoning, 1987, The global distribution of methane in the troposphere, J Atmos. chem 5, 125-171.

Steele, L.P. and P.M. Lang, 1991. Atmospheric methane concentrations-the NOAA/CMDL global cooperative flask sampling network, 1983-1988, ORNL/CDIAC-42, NDP-038.

Steele, L.P., E.J. Dlugokencky, P.M. Lang, P.P. Tans, R.C. Martin, and K.A. Masarie, 1992, Slowing down of the global accumulation of atmospheric methane during the 1980's, Nature, 358, 313.